Claims.

1. Device for simultaneously cooling and removing liquid from compressed gas of a compressor element (1) or of several compressor elements (1) which are connected either or not in parallel or in series, which device comprises a pressure vessel (2) which is provided with a liquid drain (8) at the bottom, an inlet (6) for compressed gas at a distance above the latter and an outlet (18) for compressed gas at the top, characterised in that a distribution device (4) is provided in the pressure vessel (2), between the inlet (6) and the outlet (18) for the compressed gas, for spreading a cool fluid in direct contact with the compressed gas, and in that a heat exchanger (5) is provided in the pressure vessel (2) for heating the compressed gas which has been cooled by the cool fluid.

2. Device according to claim 1, characterised in that the cool fluid is spread counterflow in the compressed gas.

3. Device according to claim 1 or 2, characterised in that a contactor (3) is provided between the inlet (6) and the distribution device (4).

4. Device according to claim 3, characterised in that the contactor (3) mainly consists of a pile of loose, either or not porous particles which are either or not piled according to a regular pattern.

5. Device according to claim 3, characterised in that the contactor (3) mainly consists of a mass with an open structure, either or not porous.

6. Device according to claim 3, characterised in that the contactor (3) mainly consists of dishes.

7. Device according to one or several of the claims 4 to 6, characterised in that the contactor (3) consists of a combination of different types of contactors.

8. Device according to claim 1, characterised in that the heat exchanger (5) for heating the gas is erected at the top in the pressure vessel (2).

9. Device according to any of the preceding claims, characterised in that the distribution device (4) for cool fluid comprises a pipe (12) opening onto the contactor (3) in the pressure vessel (2) and extending over a cooler (14).

10. Device according to claim 9, characterised in that the cooler (14) is a heat exchanger whose primary part is part of a cooling circuit (15) and whose secondary part is a part (12A) of the pipe (12).

11. Device according to claim 9 or 10, characterised in that the pipe (12) of the distribution device (4) connects to a return line (9) of the water drain (8) of the pressure vessel (2) to an injection system of the compressor element (1).

12. Device according to claim 11, characterised in that a cooler (10) is erected in the return line (9).

13. Device according to any of claims 9 to 12, characterised in that a part (12B) of the pipe (12) of the distribution device (4) is part of the heat exchanger (5) for re-heating the gas.

14. Device according to any of claims 3 to 13, characterised in that it comprises a demisting device (19) in the pressure vessel (2) above the contactor (3).

15. Device according to claim 3, characterised in that the heat exchanger (5) and the contactor (3) are thermally insulated and in that the insulation (2A) is preferably provided on the outside of the pressure vessel (2).